The Analysis of the Development Sugar Cane Production and Adequacy Raw Materials for Sugar Factory in Indonesia

M Samsul Arifien
Agribusiness Doctoral Study Program, University of Pembangunan Nasional Veteran Jawa Timur, Jl Raya Rungkut Madya, Surabaya 60294, East Java, Indonesia
msamsularifien12@gmail.com

Teguh Soedarto
Department of Agribusiness, Faculty of Agriculture, University of Pembangunan Nasional Veteran Jawa Timur, Jl Raya Rungkut Madya, Surabaya 60294, East Java, Indonesia
teguhsoedarto@upnjatim.ac.id

Hamidah Hendrarini
Department of Agribusiness, Faculty of Agriculture, University of Pembangunan Nasional Veteran Jawa Timur, Jl Raya Rungkut Madya, Surabaya 60294, East Java, Indonesia
hamidah_h@upnjatim.ac.id

Eko Nurhadi
Department of Agribusiness, Faculty of Agriculture, University of Pembangunan Nasional Veteran Jawa Timur, Jl Raya Rungkut Madya, Surabaya 60294, East Java, Indonesia
ekonurhadiupn@gmail.com

Abstract

This article analyzes that sugarcane farming in East Java, Indonesia has experienced stagnation in the last decade. Area and production do not grow and even show a decline. The yield of sugarcane productivity of only 76.1 tonnes per ha in 2021 (data from the East Java Plantation Service) is felt to be very low compared to the production potential of over 100 tonnes per ha, even in 1935 it had achieved a productivity of 140 tonnes per ha. tons of sugarcane per hectare. This article ctives are (1) to analyze the development trend of sugarcane production in 2012 – 2021. (2) to find out how much raw material is needed for sugar mills. The method used in writing this article is trend analysis and descriptive by explaining, describing, and analyzing secondary data. The results of the study show (1) The development trend of sugarcane production in 2012–2021 shows a decline, including a decrease in area of 7,038 ha, a decrease in sugarcane production of 85,380 tons, a decrease in productivity of 1.9 tons, every year. (2) Cane production cannot meet the needs of the Sugar Factory of 23,371,930 tons, 14,767,753 tons are fulfilled, the sugarcane deficit is 8,604,167 tons or equivalent to an area of 118,026 ha.

Keyword: Sugarcane Production, Raw Materials, Sugar Factory

Introduction

Agriculture in Indonesia is divided into several sub-sectors such as food crops (Itani, et al 2021). East Java is a potential province for the cultivation of food crops, including rice, sugar cane, corn, soybeans and other nuts, due to its wet tropical climate. Sugarcane as a raw material for making sugar is a strategic commodity because it is needed by all citizens without exception (Arifen & Soedarto, 2023). Sugarcane plants grow very well in East Java which has a distinct dry and rainy season. The average rainfall is 1900 mm per year. The rainy season lasts for 100 days with temperatures of 21 – 34 degrees Celsius. Meanwhile, the sugarcane plant requires 1500 – 2500 mm of rainfall per year, the air temperature is 24 – 30 degrees Celsius, and the relative humidity is 65 – 70%. The climate suitability for the sugarcane plant makes East Java the largest sugar producing province in Indonesia. Sugarcane plants have been growing well since 1850, which is indicated by the inscription on the Sugar Factory which was established around that year.

Currently, there are 29 sugar factories in East Java from 59 sugar factories in Indonesia. A total of 26 units of Sugar Mills from the Dutch era, and 3 new Sugar Mills each from PT Kebun Tebu Mas located in Lamongan Regency, PT Glenmore Sugar Industry in Banyuwangi Regency, PT Rejoso Manis in Blitar Regency. From year to year, East Java's sugar production is more than 1 million tons or contributes around 47% to the national sugar production. This production exceeds the consumption needs of the people of East Java, which is only half. Excess production is used to supply the needs of other provinces such as Central Java, eastern Indonesia, or other provinces through sugar traders.

To produce sugar, raw sugar cane is needed which comes from the sugar factory's own sugar cane plantation from the HGU land called TS (Own Sugar Cane) owned by the Sugar Factory. It also comes from sugar cane plantations as a result of a partnership between farmers and sugar factories, and the most (90%) comes from TR (People's Sugarcane). Community sugarcane is sugarcane grown by farmers independently. Based on data from the East Java Provincial Plantation Service, sugar cane production in 2021 will be 14,767,763 tons or 45.7% of the national sugarcane production of 32,340,604 tons. Low yielding sugar cane with a productivity of 76.1 tons per ha, higher than the average national productivity of 72.29 tons per ha. The criteria for low production are stated when comparing it with its potential which can reach more than 100 tons/ha. In 1935 the average national sugarcane production was 140 tonnes per hectare.

The development of sugarcane production in the last decade (2012 – 2021) has been stagnant and even tends to decline. As a result, the supply of raw materials to the Sugar Factory is reduced. The sugar factory's milling capacity is 129,270 TCD (Ton Cane Day) in East Java, only 110,719 TCD (in 2021) is fulfilled, there is idle capacity. Sugar mills must compete for sugarcane raw materials to meet daily milling capacity. When it is possible to get raw materials to reach the milling capacity per day, there are other problems in cut-and-transport speed, queues at the Sugar Factory, HR (human resources) capability in cut-and-transport management. The supply of sugar cane raw materials is stagnant and the sugar factories cannot meet the daily milling capacity. Idle capacity also occurs in the supply of sugarcane to meet demand during the milling season. The lack of raw materials resulted in the operational period of the sugar factory being short.

Low sugarcane production indicates that there are problems at the cultivation level. Farmers are not able to create a combination of input use to produce output with high productivity and efficiency. In production theory, input management in the form of land, labor and capital resources in the farming system is one of the production theories in the agricultural sector (Mubyarto, 1986). Modern farming involves more factors that can support the formation of production, as an effort to increase it. Collaboration of natural resources, human resources, technology, and the role of stakeholders in the sugarcane agribusiness system will determine the size of the production produced. If the required factors (inputs) are not fulfilled in the production process either partially or as a whole, then the resulting production is low. Production factors in the sugarcane farming system must be met, in order to obtain optimal production. Ownership of a place of business in the form of land to be planted with sugar cane, capital readiness, labor, production facilities in the form of seeds, fertilizers, pesticides, work equipment, all of which can be obtained from private or government suppliers. Subsidized fertilizers are met by the government, seeds are obtained from breeders, manual equipment and mechanization are provided by vendors or private rentals, working capital is met by banks through the government's credit scheme policy.

The facts that occur in the sugarcane production process experience many problems in the factors of production consisting of capital, land, labor, as well as farming production facilities. (1) The limited working capital owned by farmers and the difficulty of accessing banks that provide credit schemes is a problem for farmers. The requirements set by banks do not provide convenience to farmers, but tend to secure their funds by applying guarantees. Meanwhile, there are many offers of private loans with almost no requirements with high interest rates. Many farmers are stuck with the burden of returns that burden production costs. (2) Shifting of sugar cane cultivation from paddy fields to dry land, due to pressure from other annual crops which are more profitable than sugarcane. Sugarcane encroaches on less potential land, up to the highlands, forestry land, abandoned HGU land, marginal land, where sugarcane plants are still able to produce even though it is low. (3) It is very difficult to obtain skilled manpower in development areas, so labor mobilization is required. Labor difficulties are not only in development areas, in the existing areas themselves there is also a shortage of manpower due to competition with other job opportunities such as the industrial sector which provides better wages according to the UMK (District Minimum Wage) than wages as farm laborers in sugar cane fields.

The objectives of this article are (1) to analyze the trend of area development, production, and sugarcane productivity during 2012 - 2021. (2) To determine the deficit of raw materials for Sugar Mills in East Java. This article will contribute academically and contribute practically. In theory, the development of production theory, especially in the sugarcane production sector and its relation to land availability. As for the practical contribution, this article serves as a reference for stakeholders, both government and industry, to pay attention to the analysis that the author is doing, including that in Indonesia, especially in East Java Province, the development of sugar cane production fluctuates and there is a tendency to decline. Area size, productivity production

decreased during the decade of 2012 - 2021. Sugar cane production is unable to meet the raw material needs of the Sugar Factory. There is idle capacity at the processing level, because exclusive capacity is not fulfilled. Sugar factories compete for raw materials to fulfill their milling capacity. Sugar factories that are unable to compete become inefficient and lose money. Some Sugar Factory closed due to lack of supply of raw materials.

Method

This study uses the trend analysis method to determine the development of the area, production, and productivity of sugarcane with the linear equation Y = a + bX. Meanwhile, to find out the deficit of raw materials for the Sugar Factory, it is carried out descriptively by explaining, describing, analyzing data that describes the actual state of objects, events, ideas obtained from literature and experience. A simulation is also carried out on how projected the area and production of sugar cane will be developed to meet the raw material needs of the Sugar Factory in the future. Secondary data types, obtained from data sources from the East Java Province Plantation Office, Directorate General of Plantations - Ministry of Agriculture, Central Bureau of Statistics.

Result and Discussion

The Area Production and Productivity of Sugar Cane in 2012 – 2021

Secondary data from the East Java Provincial Plantation Service shows that the average area for ten years (2012–2021) is 194,462 ha, the average sugarcane production is 14,854,440 tons, and the average productivity is 72.90 tons of cane per ha. . The highest area occurred in 2014, which was 219,111 ha. However, the high area was not followed by high production because productivity was 75.23 tons/ha, lower than productivity in 2013. In 2013, the highest sugarcane production was 17,547,620 tons and productivity was also the highest, 82.84 tons/ Ha. Meanwhile, the lowest area and production occurred in 2019 covering 175,632 ha with production of 12,975,600 ha and productivity of 72.9 tonnes/ha. The following is the data we analyzed sourced from the East Java Province Plantation Office, Indonesia:

Table 1. Area, Production and Productivity of Sugar Cane in 2012-2021

Year	Area (ha)	Production (tons)	Prdtv (tonnes/ha)
2012	198.278	15.556.640	78,46
2013	211.830	17.547.620	82,84
2014	219.111	16.448.670	75.23
2015	201.973	14.360.470	67,69
2016	200.203	16.479.190	75,58
2017	179.675	13.252.610	67.68
2018	184.752	13.348.940	67,13
2019	175.632	12.975.600	67,39
2020	179.321	13.806.900	70,72
2021	193.844	14.767.763	76,30
Average	194.462	14.854.440	72,90

Source: East Java Province Plantation Office

The Trends in the Development of Sugarcane Area

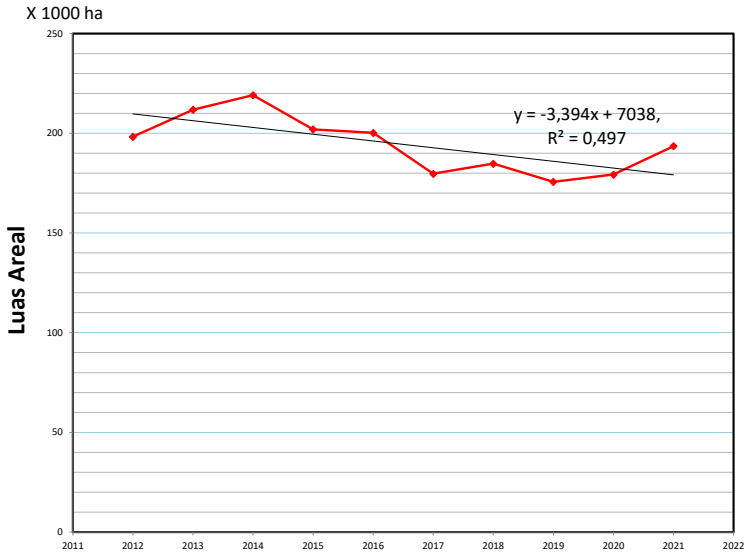

Figure 1. Trends in the Development of Sugarcane Area

Based on the data in Figure 1. The results of trend analysis, the development of the sugar cane area shows a negative development of a downtrend. In the graphic image above there is a linear line showing a decrease with the equation Y = -3.394 X + 7.038 where Y is the area of sugarcane plantations. There was a decrease of 7,038 ha every year.

However, when viewed from the development of the real area fluctuated. Sometimes it goes up and the next year it goes down. The increase in sugar cane area was caused by various influencing factors, including the weather supporting plant growth, improved sugar prices, timely arrival of production facilities in the field, government assistance, and others. On the other hand, the decrease in sugar cane area was caused by unfavorable weather which resulted in the plants not growing optimally, so that the quality of the sap stated in the yield was low and detrimental to farmers. Soraya (2022) states that narrowing the planting area will reduce total sugar production. The total area of sugar cane plantations in Java is affected by the area of sugar cane in the previous year. This means that last year the weather was good, the yield was good, the price of sugar was good, the farmers' profits were adequate, many farmers were encouraged to plant sugarcane, moreover they were facilitated by the government or a partnership with the Sugar Factory. Furthermore, Mubyarto (1989) states that land is one of the factors of production, where agricultural products are produced which have a sizable contribution to farming, because the amount of production from farming is greatly influenced by the narrow area of land used.

The Sugar Cane Production Trends

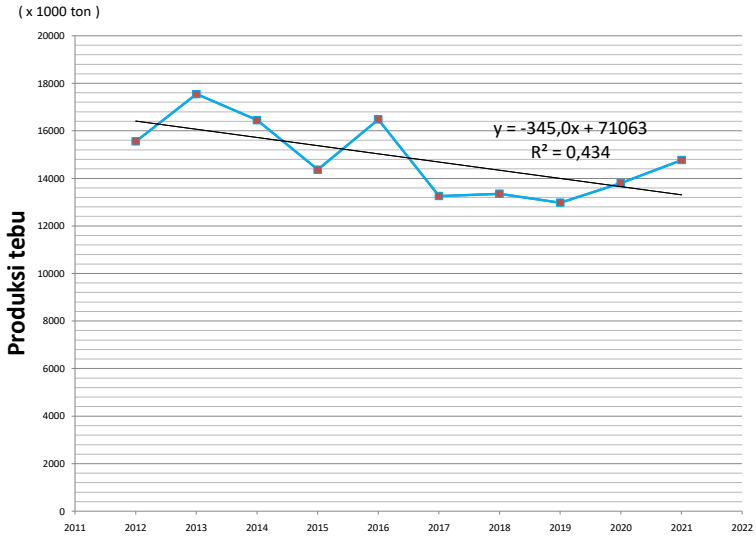

Figure 2. The Sugar Cane Production Trends

The development trend of sugarcane production shows a downtrend. In the graphic image above there is a linear line showing a decrease with the equation Y = -345 X + 71,063 where Y is sugar cane production. there was a decrease of 71,063 tons of sugarcane every year. When looking at the real production graph, it shows the temperature from year to year. The highest production occurred in 2013, then fluctuated. Until 2021 production has never reached the height as in 2013.

Based on theory and data, the level of production depends on the area and productivity. Meanwhile, based on facts, factors of production, human resources, and nature play a major role in production. Mubyarto (1986) states that production is the result of input management in the form of land resources, labor, capital, in the farming system. Modern farming involves more factors that can support the formation of production, as an effort to increase it.

Collaboration of natural resources, human resources, technology, and the role of stakeholders in the sugar cane agribusiness system will determine the size of the production produced. If the required factors (inputs) are not fulfilled in the production process either partially or as a whole, then the resulting production is low. Production factors in the sugarcane farming system must be fulfilled, in order to obtain optimal production. Ownership of a place of business in the form of land to be planted with sugarcane, readiness capital, labor, production facilities in the form of seeds, fertilizers, pesticides, work equipment, all of which can be obtained from private or government suppliers. Subsidized fertilizers are provided by the government, seeds are obtained from scalers, manual and mechanized equipment are provided by vendors or private rentals, working capital is provided by banks through the government's credit scheme policy.

Sugarcane in East Java, 85% is produced by farmers. The ability of each farmer group and individual farmer to access production factors, receive coaching, as well as educational factors, varies widely. Therefore the resulting productivity has a high variance. So that production every

year is difficult to maintain in order to produce high production. Besides, there are also natural factors that cannot be controlled, especially rainfall, the amount of irradiation, and humidity.

The Sugarcane Productivity Trends

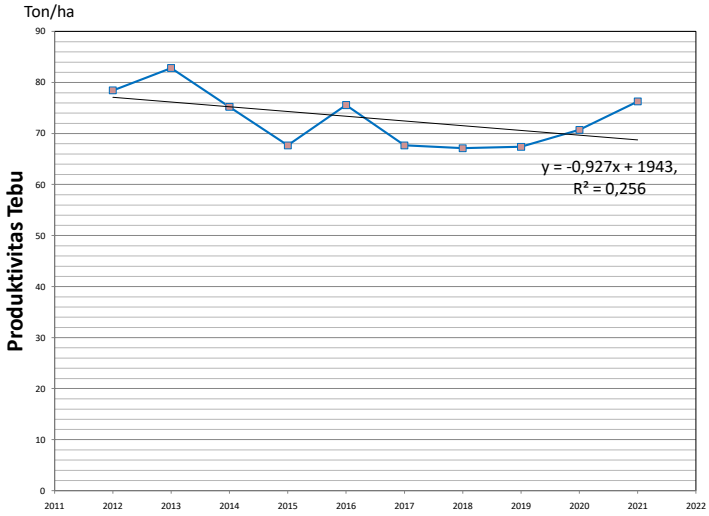

Figure 3. The Sugarance Productivity Trends

The trend of sugarcane productivity shows a downtrend. As shown in the graphic above, there is a linear line that shows a decrease with the equation Y = -0.927 X + 1943 where Y is sugarcane productivity. There was a decrease of 1.943 tons of sugarcane per hectare every year. Productivity is the ability of every company, system or person to produce something that is desired by utilizing resources effectively and efficiently and with quality. Effective is used as a value of accuracy in choosing a way of doing something in order to achieve the target. Efficient is used for accuracy in carrying out savings on existing resources. Meanwhile, quality is a measure that is used as a standard for evaluating products. Productivity as power or ability to produce is also used to assess the level of efficiency of a factory, machine, company, system or person in converting inputs into the desired output.

Sugarcane productivity is the ratio between the amount of sugarcane produced and the land area expressed in tons per hectare. The ability of the land to produce sugarcane production is based on the ability of human resources to cultivate it and the production inputs provided. Sugarcane productivity shows the value of efficiency and effectiveness in using capital, labor, production factors, with output in the form of adequate quantity and quality. The higher the quantity and quality of production, the greater the efficiency and effectiveness of the use of production factors.

The Sugar Factory Production Capacity

Production capacity is the maximum production result that can be produced in a certain time unit (Kusuma, 2009). In the planning system, the Sugar Factory determines exclusive capacity

as capacity planning before starting milling. Capacity planning has increased from year to year in line with machine rehabilitation as an effort to increase milling capacity. Besides that, the presence of 3 new sugar factories has increased the milling capacity in East Java. The milling capacity of all Sugar Mills began to increase significantly in 2016, and the highest was in 2021 of 129,937 tons of cane day. In the previous year (2012 – 2015) it ranged from 101,679 – 108,207 tons of cane day. The exclusive average capacity of sugar factories in East Java is 113,864 tons of cane day. Furthermore, inclusive capacity is conveyed, namely the realization of capacity based on the supply of sugarcane raw materials. The average is 101,763 tons of cane day. The following is the data we analyzed sourced from the East Java Province Plantation Office, Indonesia:

Table 2. Sugar Factory Production Capacity

Tahun	Exclusive Capacity (tcd)	Kapasitas Inclusive (tcd)	Hari Giling
2012	108.207	99.504	156
2013	101.679	90.841	193
2014	102.897	93.020	176
2015	106.411	104.451	137
2016	103,886	92.542	178
2017	115.400	104.102	127
2018	118.580	103.488	129
2019	124.117	105.327	123
2020	127.524	113.837	121
2021	129.937	110,719	134

Source: East Java Province Plantation Office

The Raw Material Needs for Sugar Cane Factory

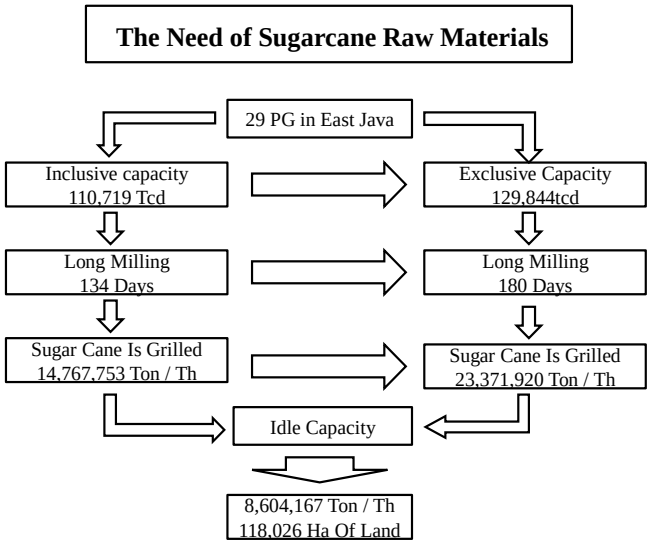

Figure 4. The Raw Material Needs for Sugar Cane Factory

The raw material requirements of the 29 Sugar Mills are delivered as an exclusive capacity in 2021 of 129,844 tons of cane day. If the standard sugar factory operates for 6 months (180 days), the raw material requirement is 23,371,920 tons of sugarcane {129,844 (capacity) x 72.9 (productivity) x 180 (milling time)}. The reality is that in 2021 the used capacity is 110,719 tons of cane days, the milling time is 134 days, the supply of raw materials is 14,767,753 tons of cane. The sugar factory lacks sugarcane raw materials of 8,604,167 tons of sugar cane (23,371,920 tons – 14,767,753 tons). If the shortage is calculated into development areas equivalent to 118,026 ha of sugarcane plants {8,604,167 (shortage of sugarcane raw materials) : 72.9 (average productivity).

Conclusions

In this article, after analyzing and describing above, it produces the following conclusions:

1. There is a trend in the development of sugarcane production in East Java, Indonesia, which has decreased: (1) Where the area of sugarcane decreased by 7,038 ha, production decreased by 85,380 tons of sugarcane, productivity decreased by 1.9 tons, every year; (2). The raw material requirement for the Sugar Factory is 23,371,920 tons of sugar cane per year, 14,767,753 tons are met, a deficit of 8,604,167 tons of sugarcane or equivalent to an area of 118,026 ha.
2. The results of the data analysis carried out by the author, in which we provide views and suggestions, that the Regional Government of East Java, Indonesia must make policies including: (1) Development of sugar cane through expansion of dry land areas, abandoned HGU land, Perhutani land while still paying attention to environmental ecosystem principles; (2) Carry out a program to increase production through intensification/maintenance of ratoons, unloading ratoons, provision of production inputs, capital strengthening, mechanization, technological guidance, to farmers; (3) Creating coaching synergies through collaboration between the government, industry, academia, commodities/cane farmers, and the mass media.

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